Military Links Developmental and Operational Testing to Meet Technology Challenges of the 21st Century

Collaboration Within the Army Now More Important Than Ever

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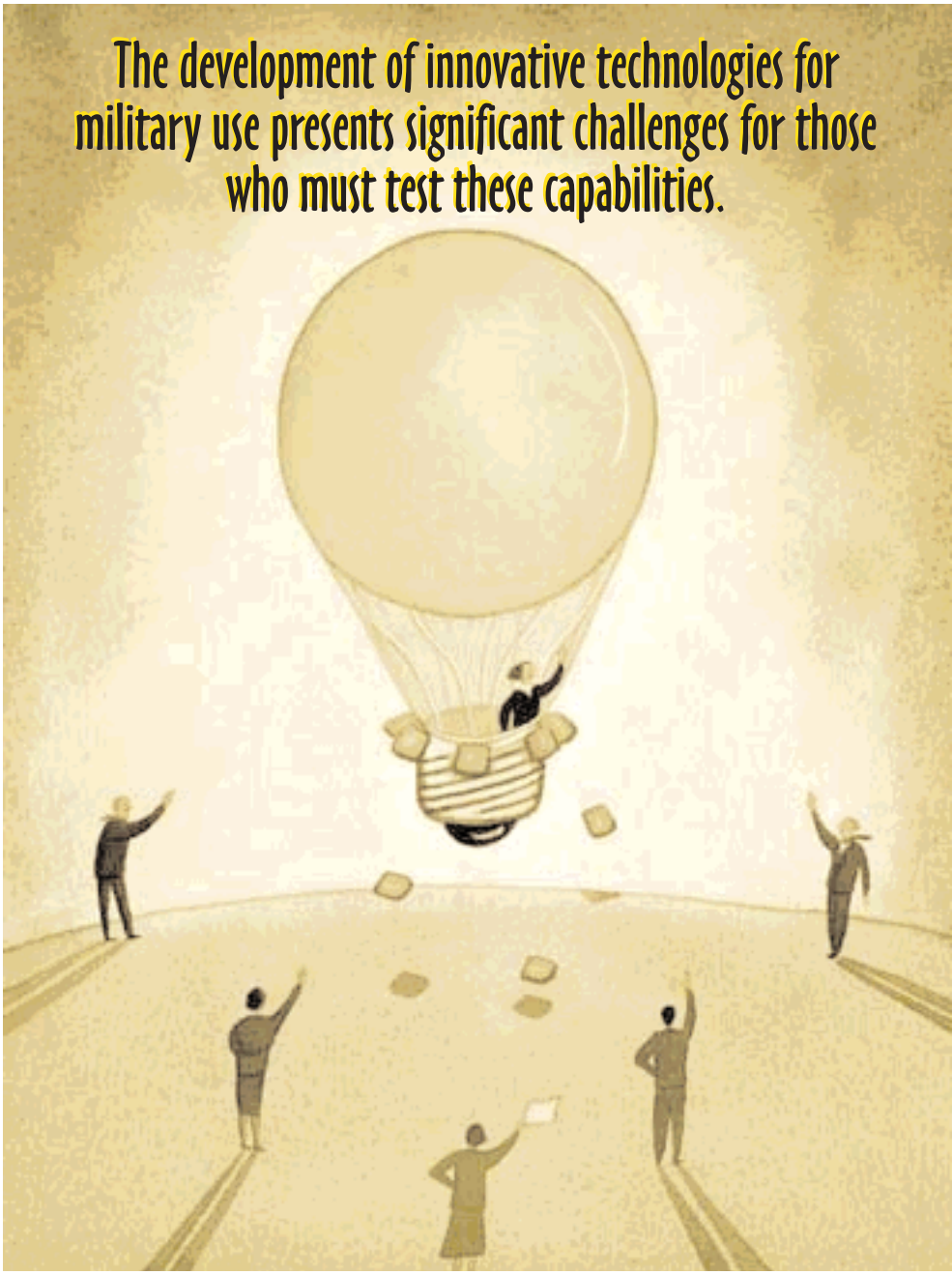
In the future, Army tanks might travel on wheels instead of tracks, or use nonferrous materials such as ceramics for armor plating. Monitors the size of a wristwatch might be used to record soldiers' heartbeat rates and other vital signs, take minute blood samples, or even administer drugs to combat stress or illness. The development of innovative technologies for military use presents significant challenges for those who must test these capabilities.



Engineers and scientists from government and industry research laboratories and facilities that test military equipment met April 11-12 at the 13th Annual Test Technology Symposium in Ellicott City, Md., to discuss these and similar technologies that could benefit tomorrow's armed forces. Representatives of various academic institutions as well as engineers from Germany, France, the United Kingdom, and Australia also joined in the discussions.

The symposium, sponsored by the U.S. Army Developmental Test Command (DTC), focused on emerging technologies for testing new military weapon systems and equipment as they evolve from engineering concepts and become reality. The conference underscored efforts in the U.S. armed forces to achieve closer collaboration among the laboratories and

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centers that test and evaluate new military hardware and equipment.

The three U.S. military departments have all undertaken initiatives to link the tests of systems under development with the operational tests that involve test exercises in the field. To reach this goal, the Army reorganized its test and evaluation program in October 1999 to place developmental and operational testing under one command. The Army Test and Evaluation Command (ATEC), headquartered in Alexandria, Va., now oversees three subordinate Army agencies that conduct the tests and evaluations. The DTC, headquartered at Aberdeen Proving Ground, Md., is responsible for tests that enable military program managers to determine the performance and effectiveness of systems under development. The Operational Test Command (OTC), headquartered at Fort Hood, Texas, manages operational tests under field conditions. The Army Evaluation Center, headquartered with ATEC in Alexandria, evaluates the data obtained from both types of tests to determine a system's operational effectiveness, suitability, and survivability.

Military test centers working closely together to provide the nation's armed forces with the latest technology and equipment is nothing new, said Brian Barr, ATEC's technical director and one of the keynote speakers at the symposium. But this collaboration within the Army is now more important than ever, he said, because of the Army's push to become a more mobile, versatile, lethal, and agile force, capable of the "full spectrum" of missions that may come its way in the 21st century. While cautioning that developmental and operational testing will need to remain separate programs in many respects, he said a broad exchange of information and new test technologies is critical to the successful development and fielding of technologically complex systems required by modern military forces. The challenges that confront testers include resource constraints as well as technology, he added.

Due to the Army's reduction in force, which makes it difficult to have military units available for tests of new equipment in the field, Army testers are seeking to integrate system tests into standard training events, he said. Testers can't control training events, however, so it remains a challenge to get the necessary system performance data in this way. Army test engineers are working to develop ever-smaller data collection modules that can be integrated into vehicles and other equipment, to make data collection less visible and obtrusive to soldiers who use the equipment.

Army leaders have mandated ambitious schedules for acquiring new equipment such as the lighter armored vehicles needed by the Brigade Combat Team, which must be able to deploy anywhere in the world by C-130 aircraft within 96 hours. The tight acquisition schedules will greatly impact testers and necessitate simultaneous rather than sequential tests, Barr said. Systems now coming off the drawing boards are also being designed for joint use by all the military services, he added, so there is a greater need for the Army, Navy, and Air Force to collaborate on testing.

Barr and other speakers noted that modeling and simulation will play an increasingly important role in military testing, not only to focus tests on critical components and reduce the environmental impacts and costs of firing weapons, for example, but also to create simulated "test environments" for various types of systems, some of which can not be tested any other way.

"Our national missile defense program is the largest, most complex system I've been involved with during my 25 years in the test and evaluation program," Barr said. "For missile defense systems, it will never be possible to do full-scale operational tests, as we obviously can't launch a missile at the United States."

Several symposium speakers emphasized the complexity of emerging weapon systems and technologies, pointing out the need to modernize test facilities and ranges while using or developing increasingly sophisticated test instrumentation. Testers also face the challenge of doing their work "better, faster, cheaper, and smarter" to remain effective in the wake of budget and personnel cuts to military test programs over the past several years. Although modeling and simulation can never completely replace traditional tests such as live fire, these and other innovative methods can save scarce resources, cut costs, help testers meet tighter schedules, and improve the testing program, said Col. Andrew Ellis, commander of the DTC's Aberdeen Test Center (ATC).

"We've used a finite element analysis model to find the stress points (on an armored vehicle) and used live fire only on those stress points," Ellis explained. "We saved about $250,000 for the program manager. We have a gymnasticator, or gun banger, that can test the recoil systems on large guns without us having to fire them. The future capabilities of our data acquisition will sharply increase as the desire for rapid data turnaround increases. We're figuring out how to provide real-time data to a test customer at the site."

Technologies that enable satellite relay of test data will not only rapidly give test customers the information they need to make decisions, Ellis said, but also enable tests to take place at locations remote from formal test centers. Echoing Barr's remarks, Ellis added that unobtrusive, embedded data acquisition systems, such as monitors built into vehicle engines, for example, would give testers the ability to see if performance in the field matches developmental specifications.

The use of modeling and simulation, the ability to conduct tests at sites other than test centers, and close partnerships with test customers were also themes underscored by Brian Simmons, technical director of the DTC, during his presentation at the symposium. He pointed out that test customers, primarily program managers responsible for acquiring weapons systems and equipment, pay a large percentage of the test costs, and they have the option to do business elsewhere if they are not satisfied with a test center. This gives the test centers an

A Bradley Fighting Vehicle is suspended from cranes to determine its center of gravity while another heads for a steep climbing event, both part of the evaluations that candidate Infantry Carrier Vehicles are undergoing at the Aberdeen Test Center.

added incentive to conduct high-quality, reliable tests, he said.

"Developmental testing is discretionary, and there is no impetus to use the DTC," he said. "So what we have, and what we can do, must be responsive to the needs of the Army. We are clearly on the same team as the program managers."

Simmons also described the DTC's modeling and simulation work, including a command initiative called the Virtual Proving Ground (VPG), part of an Army initiative dubbed Simulation and Modeling for Acquisition Requirements and Training (SMART). Among its diverse programs, the VPG includes the ATC's "gun banger" and simulations that test aircraft and vehicle performance without needing to fly or drive the test items. The VPG also includes a laser targeting system that enables testers to check the aim of tank guns without firing rounds, as well as a variety of other modeling or simulation technologies. These technologies support customers by cutting millions of dollars in test costs each year, Simmons said.

Modeling can also cut costs by helping test directors be properly prepared to get the best data possible from expensive, destructive tests such as missile flights at White Sands Missile Range, where a test can cost $1 million a day, he said.

Program managers have seen the benefit of these technologies and have provided funding to build some of the innovative test facilities, he added.

"There is nothing more important that we can do than support the Virtual Proving Ground," Simmons said. "All of this is anchored in real testing and is a tool, not a replacement for physical testing."

Symposium attendees got a somber reminder of the primary goal of military testing — saving the lives of U.S. servicemembers — when George Rumford of the Defense Department's Foundation Initiative 2010 displayed a slide showing the names of the 19 Marines killed during the April 8 crash of the Marine Corps' MV22 Osprey in Marana, Ariz. Noting that there was no reason to believe testing on the MV22 was inadequate and that theories on the cause of the crash would be speculative

A Bradley Fighting Vehicle is suspended from cranes to determine its center of gravity, one of many evaluations that candidate Infantry Carrier Vehicles are undergoing at the Aberdeen Test Center.

before the investigation is complete, Rumford nonetheless emphasized the crucial importance of military testing to prevent system failure and loss of life.

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A truck in the Army's Family of Medium Tactical Vehicles is banked on the Aberdeen Test Center's tilt table to check its stability on steep grades. This is one of the many evaluations being performed on Infantry Carrier Vehicle bid samples.

Photos by Army Sgt. 1st Class Esteller Sapp